

CLAIMS

1. A method for use in a cellular communications system that includes a macro cell encompassing a smaller micro cell, comprising:
 - establishing an uplink communication cell boundary between the macro cell and the micro cell, and
 - establishing a downlink communication cell boundary between the macro cell and the micro cell different from the uplink communication cell boundary.
2. The method in claim 1, wherein the uplink communication cell boundary is larger than the downlink communication cell boundary.
3. The method in claim 2, wherein the downlink communication cell boundary is established by reducing a power at which a broadcast signal is transmitted from a base station associated with the micro cell.
4. The method in claim 2, wherein the downlink communication cell boundary is established by tilting a downlink antenna beam of a base station associated with the micro cell that transmits a broadcast signal from the micro cell to reduce the coverage of the broadcast signal.
5. The method in claim 2, wherein the downlink communication cell boundary is established by decreasing a detected power level of a signal transmitted by the micro cell.
6. The method in claim 2, further comprising:
 - determining whether an uplink interference level at the micro cell base station exceeds a threshold, and if so, performing an interference cancellation operation to compensate for the uplink interference level.
7. The method in claim 6, further comprising:
 - determining whether to compensate for one or both of intra-cell uplink interference in the micro cell and inter-cell uplink interference in the micro cell, and
 - detecting one or more parameters regarding one or more mobiles on the macro cell side of the downlink communication cell boundary, and

providing those one or more parameters for use in uplink interference cancellation in the micro cell.

8. The method in claim 2, further comprising:
determining that a mobile station is moving a velocity greater than a predetermined velocity, and
effectively decreasing the downlink communication micro cell boundary.

9. A method for use in a cellular communications system that includes a macro cell encompassing a smaller micro cell, the macro cell including a macro cell base station and the micro cell including a micro cell base station, comprising:

determining whether a condition in the system indicates that a downlink cell boundary between the macro cell and the micro cell and an uplink cell boundary between the macro cell and the micro cell should be unbalanced; and

if the condition is met, reducing the downlink micro cell boundary to effect an unbalance between the uplink and downlink microcell boundaries.

10. The method in claim 9, wherein the condition is based on a probability that a mobile station in the system will not receive a predetermined service quality when the uplink and downlink micro cell boundaries are balanced.

11. The method in claim 9, wherein the condition is based on one or more of the following: system load, traffic, radio link propagation condition between the macro cell base station and the mobile station, height of an antenna in the macro cell base station, cell size, geographical relationship between the macro cell base station and the micro cell base station, and mobile station speed.

12. The method in claim 9, wherein the downlink cell boundary is reduced by reducing a power at which a pilot signal is transmitted from a base station associated with the micro cell.

13. The method in claim 9, wherein the downlink cell boundary is reduced by tilting a downlink antenna beam of the micro cell base station that transmits a micro cell pilot signal.

14. The method in claim 9, wherein the downlink cell boundary is reduced by decreasing a detected power level of a pilot transmitted by the micro cell base station.

15. The method in claim 9, further comprising:
determining if interference associated with an uplink transmission from a mobile station to the macro cell base station is likely to exceed a predetermined limit, and
if so, performing interference cancellation the micro cell base station.
16. Apparatus for use in a cellular communications system that includes a macro cell encompassing a smaller micro cell, comprising:
means for establishing an uplink communication cell boundary between the macro cell and the micro cell, and
means for establishing a downlink communication cell boundary between the macro cell and the micro cell different from the uplink communication cell boundary.
17. The apparatus in claim 16, wherein the uplink communication cell boundary is larger than the downlink communication cell boundary.
18. The apparatus in claim 17, further comprising:
means for reducing a power at which a broadcast signal is transmitted from a base station associated with the micro cell to reduce the downlink communication cell boundary.
19. The apparatus in claim 17, further comprising:
means for tilting a downlink antenna beam of a base station associated with the micro cell that transmits a pilot signal from the micro cell to reduce the coverage of the pilot signal.
20. The apparatus in claim 17, further comprising:
means for decreasing a detected power level of a signal transmitted by the micro cell.
21. The apparatus in claim 17, further comprising:
means for determining whether an uplink interference level at the micro cell base station exceeds a threshold, and if so, performing an interference cancellation operation at a receiver at the micro cell to compensate for the uplink interference level.
22. The apparatus in claim 21, further comprising:
means for determining whether to compensate for intra-cell uplink interference in the micro cell, inter-cell uplink interference in the micro cell, or both;

means for detecting one or more parameters regarding one or more mobiles on the macro cell side of the downlink communication cell boundary; and

means for providing the one or more parameters for use in uplink interference cancellation in the micro cell.

23. The apparatus in claim 17, further comprising:

means for determining that a mobile station is moving a velocity greater than a predetermined velocity, and

means for effectively decreasing the downlink communication cell boundary.

24. A node for use in a cellular communications system that includes a macro cell encompassing a smaller micro cell, the macro cell including a macro cell base station and the micro cell including a micro cell base station, comprising:

a supervisory controller configured to control one or more operations of the macro cell base station and the micro cell base station, and

a link balance controller, coupled to the supervisory controller, configured to determine whether a condition indicates that an unbalanced link should be implemented between a downlink cell boundary between the macro cell and the micro cell and an uplink cell boundary between the macro cell and the micro cell, and if so, to reduce the downlink micro cell boundary to implement the unbalanced link.

25. The node in claim 24, wherein the node is a radio network controller.

26. The node in claim 24, wherein the condition is based on a probability that a mobile station in the system will not receive a predetermined service quality when the uplink and downlink micro cell boundaries are balanced.

27. The node in claim 24, wherein the condition is based on one or more of the following: system load, traffic, radio link propagation condition between the macro cell base station and the mobile station, height of an antenna in the macro cell base station, cell size, geographical relationship between the macro cell base station and the micro cell base station, and a mobile station's speed.

28. The node in claim 24, wherein link balance controller is configured to transmit a command to the micro cell base station to reduce a power at which a pilot signal is transmitted from the micro cell base station.

29. The node in claim 24, wherein link balance controller is configured to transmit a command to the micro cell base station to tilt a downlink antenna beam of the micro cell base station that transmits a pilot signal from the micro cell.

30. The node in claim 24, wherein the link balance controller is configured to employ an offset to reduce a detected power level of a pilot transmitted by the micro cell base station.

31. The node in claim 30, wherein link balance controller is configured to transmit a command to one or more mobile stations in the system to reduce a detected power level of a pilot transmitted by the micro cell base station by an offset amount included in the command.

32. The node in claim 24, wherein link balance controller is configured to determine if interference associated with an uplink transmission from a mobile station to the macro cell base station is likely to exceed a predetermined limit, and if so, to transmit a command to the micro cell base station to perform interference cancellation.

33. A hierarchical cell structure (HCS) system, comprising:
a macro cell encompassing a smaller micro cell, the macro cell including a macro cell base station and the micro cell including a micro cell base station, and
a radio network controller, coupled to the macro cell base station and the micro cell base station, configured to determine whether an unbalanced link should be implemented between a downlink cell boundary between the macro cell and the micro cell and an uplink cell boundary between the macro cell and the micro cell, and if so, to reduce the downlink micro cell boundary to implement the unbalanced link.

34. The HCS system in claim 33, wherein radio network controller is configured to transmit a command to the micro cell base station to reduce a power at which a pilot signal is transmitted from the micro cell base station.

35. The HCS system in claim 33, wherein radio network controller is configured to transmit a command to the micro cell base station to tilt a downlink antenna beam of the micro cell base station that transmits a pilot signal from the micro cell.

36. The HCS system in claim 33, wherein radio network controller is configured to employ an offset to reduce a detected power level of a pilot transmitted by the micro cell base station.

37. The HCS system in claim 36, wherein the radio network controller sends a command with the offset to one or more mobile stations in the system to reduce mobile-detected pilot power levels.